

REMARKS

Claims 1, 2, 5, 7, and 9 are pending in the application. Claims 3, 4, 6, 8, and 10 have been cancelled. Claims 1 and 9 have each been amended to more particularly point out and claim the invention. In particular, claims 1 and 9 have been amended to recite that the claimed method comprises a step of depositing a silicon nitride layer by means of a dual-frequency plasma enhanced CVD process, the CVD process comprising a temperature of 480° C, a low frequency power of 40 W, and a high frequency power of 100W. Support for these amendments is found at least in the original claims 6 and 8. No new matter has been added by the foregoing amendments.

Claim Rejection – 35 U.S.C. § 103 – claims 1-10

The Examiner has rejected claims 1-10 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,545,370 (Ngo *et al.*, hereinafter “Ngo”) in view of U.S. Patent Application Publication No. 2005/0170104 (Jung *et al.*, hereinafter “Jung”). The Examiner relies upon Ngo to disclose a method of forming a semiconductor device using a dual-frequency plasma enhanced CVD process (PECVD). The Examiner admits that Ngo fails to disclose the features of the PECVD process comprising: a temperature in the range of 400 deg C to 550°C; a pressure in the range of 2 to 5 Torr; a low frequency power in the range of 0 to 50 Watts; a high frequency power in the range of 90 to 110 Watts; and precursor gases of silane, ammonia, and nitrogen at flow rates in the ratio in the range of 240:3200:4000 sccm. The Examiner relies upon Jung to disclose these features. The Examiner asserts that since Ngo and Jung are from the same field of endeavor, the purpose disclosed by Jung would have been recognized in the pertinent art of Ngo. Applicants respectfully traverse rejection of claims 1, 2, 5, 7, and 9. Rejection of claims 3, 4, 6, 8, and 10 is moot in view of cancellation of these claims.

Jung was filed on January 29, 2004. Jung has a U.S. filing date that is earlier than the U.S. filing date of the present application (June 29, 2004), but did not publish as a patent application publication until August 4, 2005. Accordingly, Jung has a U.S. filing date that is earlier than the U.S. filing date of the present application, but was published after the filing date of the present U.S. application.

Applicants have submitted herewith a Declaration pursuant to 37 C.F.R. § 1.131 to antedate (i.e. “swear behind”) the Jung reference. As the Examiner will note from the Declaration, Applicants invented the subject matter of the present application prior to the filing date of January 29, 2004 of the Jung application. As evidence of that fact, Applicants have submitted a copy of an invention disclosure form used by Applicants then employer (and assignee of the present application), International Business Machines Corporation (“IBM”). Invention Disclosure Form FIS8-2003-0458 was submitted to an IBM invention disclosure team prior to the January 29, 2004. A decision to perform a patentability search was made by the invention disclosure team in February, 2004. Applicants worked diligently with an IBM patent attorney between the time the decision to perform a patentability search was made in February, 2004 until the present application was filed in June, 2004. Accordingly, Jung does not qualify as prior art under 35 U.S.C. § 102, and would not qualify as prior art under 35 U.S.C. § 103 for the same reasons.

Futhermore, even assuming *arguendo* that Jung qualifies as prior art for the present application, Applicants respectfully submit that Ngo and Jung are not properly combinable under 35 U.S.C. §103(a), and do not establish a *prima facie* case of obviousness. When making a rejection under 35 U.S.C. § 103, the Examiner has the burden of establishing a *prima facie* case of obviousness. The Examiner satisfies this burden only by showing (1) some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the references, (2) a reasonable expectation of success and (3) the prior art references much teach or suggest all of the claim limitations (see MPEP 706.02(j)). The teaching or suggestion to make the claim combination and reasonable expectation of success must be found in the prior art and not from the applicant’s disclosure (see MPEP 706.02(j)). Further, the mere fact that the prior art could be modified in the manner proposed by the Examiner, does not make the modification obvious unless the prior art suggests the desirability of the modification. *Ex parte Dussaud*, 7 U.S.P.Q. 2d 181, 1820 (PTO Bd. App. & Int. 1988).

Ngo and Jung are not properly combinable under 35 U.S.C. § 103(a). Ngo discloses a semiconductor device comprising composite silicon nitride sidewall spacers. The sidewall

spacers include an inner layer formed at a deposition temperature of about 380° C to about 420° C, a high frequency power of about 350 to about 450 Watts, and a low frequency power of about 10 to about 200 Watts. The sidewall spacers further include an outer layer formed at a deposition temperature of about 360° C to about 380°C, a high frequency power of about 200 to 350 Watts, and a low power frequency of about 10 to about 200 Watts. Ngo discloses the outer layer to have an excess amount of nitrogen such that there is virtually no free silicon available to react with nickel subsequently deposited. See Ngo, column 4, lines 31-61. Ngo seeks to eliminate electrical bridging between nickel silicide layers on a gate electrode and the source/drain regions. See Ngo, column 2, lines 10-15.

Jung discloses a method of tuning the stress of a single-layer silicon nitride film by controlling certain film deposition parameters of a PECVD process. Jung discloses achieving desired stress characteristics with a deposition temperature of about 375° C to about 525° C, a high frequency power in the range of about 10 Watts to about 200 Watts, and a low frequency power in the range of about 0 Watts to about 100 Watts. See Jung, Abstract and claim 1.

The Examiner has asserted that “[s]ince Ngo and Jung are from the same field of endeavor, the purpose disclosed by Jung would have been recognized in the pertinent prior art of Ngo.” Applicants respectfully disagree. Jung and Ngo are directed to entirely different problems. Ngo seeks to determine PECVD process conditions which result in desirable silicon and nitrogen content in a silicon nitride spacer, such that electrical bridging between nickel silicide layers on the gate electrode and the source/drain regions is reduced. Jung seeks to determine PECVD process conditions which result in particular stress conditions in a single-layer silicon nitride film. The person of ordinary skill seeking to reduce or eliminate electrical bridging between nickel silicide layers and source/drain regions would not be motivated to look to prior art directed to the very distinct problem of tuning stress conditions in a silicon nitride film. The Examiner has not pointed to any specific teaching or suggestion to combine Ngo and Jung, nor would the artisan recognize any motivation for combining Ngo and Jung.

Jung does not qualify as prior art relative to the present application. Furthermore, even if it were assumed *arguendo* that Jung is prior art, neither combination nor modification of Ngo

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and Jung would be taught or suggested by the prior art. It is therefore respectfully submitted that a *prima facie* case for obviousness has not been established with respect to claims 1, 2, 5, 7, and 9. Accordingly, it is respectfully requested that the rejection of claims 1, 2, 5, 7, and 9 under 35 U.S.C. § 103(a) be withdrawn.

CONCLUSION

In view of the foregoing amendment and remarks, Applicants respectfully submit that the present application, including claims 1, 2, 5, 7, and 9, is in condition for allowance, and such action is respectfully requested.

Respectfully submitted,

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